CLAIMS

1. An emitter, comprising:

an electron source;

a cathode having an emissive surface; and

a continuous anisotropic conductivity layer disposed between the electron source and the emissive surface of the cathode wherein the anisotropic conductivity layer has an anisotropic sheet resistance profile.

2. The emitter of claim 1 further comprising a tunneling layer disposed between the anisotropic conductivity layer and the cathode.

3. The emitter of claim 2 further comprising an emissive layer disposed between the tunneling layer and the anisotropic conductivity layer.

4. The emitter of claim 1 wherein the cathode layer includes an array of Spindt tips capable of field emission.

5. The emitter of claim 4 wherein the array of Spindt tips is chaotically scattered on the cathode layer.

6. The emitter of claim 1 wherein the anisotropic conductivity layer comprises a diamond like carbon layer.

7. The emitter of claim 1 wherein the efficiency of the emitter is greater than two percent.

8. The emitter of claim 1 wherein the anisotropic conductivity layer has a length, width and thickness and wherein the sheet resistivity of the anisotropic conductivity layer in the thickness direction is at least one-half the sheet resistivity of the anisotropic conductivity layer in the length and width directions.

9. The emitter of claim 8 wherein the sheet resistivity of the anisotropic conductivity layer in the thickness direction is about 1 x 10^7 to about 1 x 10^{10} ohm centimeters.

10. The emitter of claim 1 wherein the anisotropic conductivity layer is a self-organized array.

11. The emitter of claim 1 wherein the anisotropic conductivity layer is an artificially assembled array.

12. The emitter of claim 1 further comprising a polysilicon layer having a plurality of nodules disposed between the anisotropic conductivity layer and the cathode.

13. The emitter of claim 1 wherein the anisotropic conductivity layer is formed with a columnar structure.

14. The emitter of claim 13 wherein the columnar structure is formed by sputtering a resistive material.

15. The emitter of claim 14 wherein the resistive material is silicon.

16. The emitter of claim 14 wherein the resistive material is diamond-like carbon.

17. The emitter of claim 1 wherein the anisotropic conductivity layer includes a micro-patterned resistive channel.

18. The emitter of claim 1 wherein the electron source is a semiconductor substrate and the anisotropic conductivity layer comprises a patterned or structured semiconductor epitaxial layer having a higher conductivity than the semiconductor substrate.

19. The emitter of claim 1 wherein the anisotropic conductivity layer comprises a plurality of pn junctions interconnected by a restive material.

20. An integrated circuit, comprising:

a substrate;

at least one emitter of claim 1 disposed on the substrate; and

circuitry formed on the substrate with the emitter for operating the at least one emitter.

21. An electronic device, comprising:

the emitter of claim 1 for emitting energy; and

an anode structure for receiving the emitted energy and generating at least a first effect in response to receiving the emitted energy and a second effect in response to not receiving the emitted energy.

22. The electronic device of claim 21 wherein the electronic device is a mass storage device and the anode structure is a storage medium, the electronic device further comprising a reading circuit for detecting the effects generated on the anode structure.

23. The electronic device of claim 21 wherein the electronic device is a display device and the anode structure is a display screen that creates a visible effect in response to receiving the emitted energy.

24. The electronic device of claim 23 wherein the display screen includes one or more phosphors operable for emitting photons in response to receiving the emitted energy.

25. The emitter of claim 1 further comprising an electronic lens structure disposed upon the cathode.

26. The emitter of claim 1 capable of emitting photons in addition to the electron emission.

27. A display device, comprising:

an integrated circuit including the emitter of claim 26, wherein the emitter creates a visible light source from the emitted photons; and

a lens for focusing the visible light source, wherein the lens is coated with a transparent conducting surface to capture electrons emitted from the emitter.

28. An emitter, comprising:

an electron source;

a cathode for emitting electrons received from the electron source; and

means for regulating the flow of electrons from the electron source to the cathode wherein the emission of electrons from the cathode is substantially uniform over its emitting surface wherein the means is continuous over the surface of the electron source.

29. An emitter, comprising:

a substrate;

an insulating layer disposed on the substrate and defining an opening for an electron source from the substrate;

an anisotropic conductivity layer disposed continuously on the insulating layer and the electron source, said anisotropic conductivity layer having an anisotropic sheet resistivity profile;

an emission layer disposed on the anisotropic conductivity layer; and

a cathode layer disposed on the emission layer.

30. The emitter of claim 29 wherein the emission layer comprises a tunneling electron layer.

31. The emitter of claim 29 wherein the emission layer comprises an array of field emitters.

32. The emitter of claim 29 further comprising an electronic lens structure formed on the cathode layer.

33. An electronic device, comprising:

at least one emitter to generate an electron beam from a cathode layer, the emitter having an electron source, an array of emission sites, and a continuous anisotropic conductivity layer disposed between the electron source and the cathode layer wherein the emission of the electron beam is substantially uniform over the cathode layer from each of the emission sites;

an electron lens for focusing the electron beam to create a focused beam; and

a target medium in close proximity to the at least one emitter, the target medium having a target area being in one of a plurality of states to represent the information represented in that target area;

such that:

an effect is generated when the focused beam strikes the target area;

the magnitude of the effect depends on the state of the target area; and the information represented in the target area is determined by the magnitude of the effect.

34. The electronic device of claim 33 wherein the electronic device is a mass storage device and the target area is a storage area of recordable media and the effect generated is a signal current.

35. The electronic device of claim 33 wherein the electronic device is a display device and the target area is a display pixel of luminous material and the effect generated is optical light.

36. A computer system, comprising:

a microprocessor;

the electronic device of claim 33 coupled to the microprocessor; and

memory coupled to the microprocessor, the microprocessor operable of executing instructions from the memory to transfer data between the memory and the electronic device.

37. The computer system of claim 36 wherein the electronic device is a storage device.

38. The computer system of claim 36 wherein the electronic device is a display device.

39. An emitter, comprising:

a substrate;

an insulator layer formed on the substrate and having a first opening defined within;

a continuous anisotropic conductivity layer having an anisotropic sheet conductivity profile disposed over the insulator layer and first opening and contacting the substrate;

a tunneling layer formed on the anisotropic conductivity layer; and

a cathode layer disposed on the tunneling layer wherein a portion of the cathode layer on the tunneling layer is an electron-emitting surface.

40. The emitter of claim 39 wherein the anisotropic conductivity layer has conductivity about 2 to about 10 times greater in the thickness of the anisotropic conductivity layer than in the plane of the anisotropic conductivity layer.

41. The emitter of claim 39 wherein the anisotropic conductivity layer is a polysilicon layer that is formed of a self assembled array of emission centers with a serial resistance connected to each single emission center.

42. The emitter of claim 39 wherein the anisotropic conductivity layer is an artificially created conductivity channel array of emission centers with a serial resistance connected to each single emission center.

43. The emitter of claim 42 wherein the emission center is a pn junction diode.

44. The emitter of claim 42 wherein the emission center is a patterned resistive channel.

45. The emitter of claim 42 wherein the emission center is a patterned or structured epitaxial semiconductor having a higher conductivity than the serial resistance.

46. The emitter of claim 39 having an efficiency of greater than about two percent.

47. The emitter of claim 39 having an efficiency of greater than about 10 percent.

48. The emitter of claim 39 capable of a stabilized emission of greater than two Amps/cm^2.

49. The emitter of claim 39 capable of a stabilized emission of greater than 8 Amps/cm^2.

50. The emitter of claim 39 wherein the rate of emission of electrons is substantially uniform over the electron emitting surface.

51. A method of creating an emitter, comprising the steps of:

applying a continuous anisotropic conductivity layer having an anisotropic conductivity profile onto the electron source; and

creating an emission source on the anisotropic conductivity layer.

52. The method of claim 51 wherein the step of creating the anisotropic conductivity layer comprises the step of applying a self-assembled array of emission sites with a serial back resistance.

53. The method of claim 52 wherein the step of applying a self-assembled array comprises the step of depositing a polysilicon layer having a higher conductivity in its thickness direction than the conductivity in its plane directions.

54. The method of claim 52 wherein the step of applying a self-assembled array comprises the step of sputtering polysilicon or diamond-like carbon material such that columnar structures are formed between the electron source and the emission source.

55. The method of claim 51 wherein the step of applying an anisotropic conductivity layer comprises the step of artificially assembling an array of emission sites with a serial back resistance.

56. The method of claim 55 wherein the step of artificially assembling an array comprises the steps of:

applying a layer of resistive material;

applying a template on the layer of resistive material, the template defining the location of the emission sites; and

doping the templated resistive material to create a resistive layer with an anisotropic conductivity profile wherein the conductivity is highest in the thickness direction of the resistive layer.

57. The method of claim 56 wherein the step of doping the templated resistive material creates a pn junction diode.

58. The method of claim 56 wherein the step of applying a layer of resistive material comprises the step of applying a layer of epitaxial semiconductive material.

59. The method of claim 55 wherein the step of artificially assembling an array comprises the steps of:

applying a template on the electron source, the template having a plurality of openings defining the location of the emission sites; and

applying a low resistive material within the plurality of openings in the template;

removing the template; and

applying a high resistive material between the applied low resistive material.

60. A method of controlling an array of emission sites, comprising the steps of:

regulating the flow of electrons from an electron source to the array of emission sites wherein the rate of emissions from each emission site is substantially uniform and wherein the conductivity from the electron source to each emission site is about 2 to about 10 times greater than the conductivity between each of emission sites to each other.